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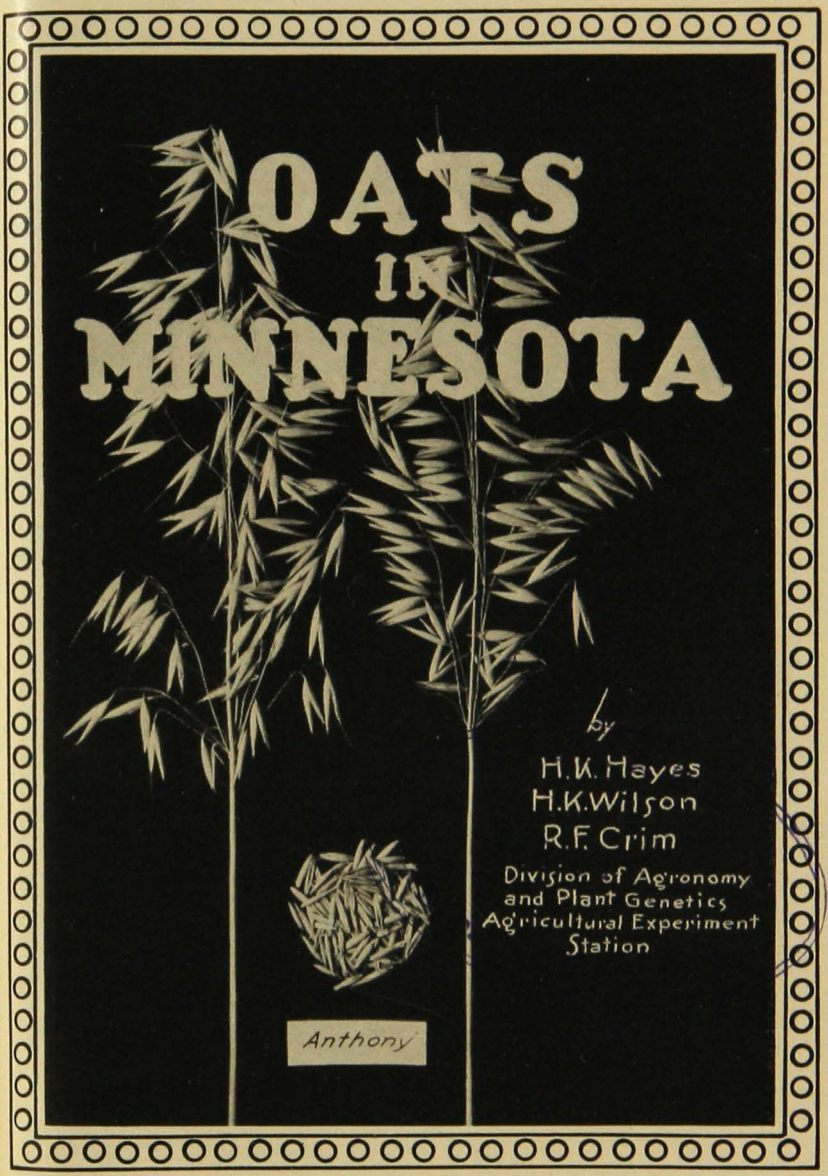

UNIVERSITY OF MINNESOTA
AGRICULTURAL EXTENSION DIVISION

Published in furtherance of Agricultural Extension, Act of May 8, 1914. W. C. Coffey, Acting Director, Agricultural Extension Division, Department of Agriculture, University of Minnesota, Co-operating with U. S. Department of Agriculture.

THE place of oats in the Minnesota farm rotation, their suitability as a companion crop, and the ease with which a fair yield may be obtained under widely differing conditions have been responsible for a continuing interest in the crop in this state.

Because of this interest, the Division of Agronomy and Plant Genetics, co-operating with the Division of Plant Pathology and Botany, has sought to develop varieties of oats that excel in agronomic characters, particularly in strength of straw, in yielding ability, and in resistance to diseases. Varieties having these qualities tend to stabilize production.

Results of the work of the two divisions named are summarized for ready use in this bulletin, as a guide to farmers in different parts of the state in choosing varieties suited to their needs and the conditions under which the crop must be grown.

OATS IN MINNESOTA

IN cash value per acre, oats commonly give a lower return than other grain crops. However, farmers have continued to grow a relatively large acreage of oats. The place of oats in the farm rotation, their suitability for a companion crop, and the ease with which a fair yield may be obtained under widely differing conditions have been responsible for the continued interest in the crop.

THE IMPORTANCE OF OATS AS A FARM CROP

In spite of the low prices in 1932, of the four major grain crops grown in Minnesota, oats ranked second in total value, with corn in the lead. The 1932 production of oats in Minnesota was 164,700,000 bushels. At 10 cents a bushel, the farm price on November 15, 1932, this crop represented a value of $16,470,000. In the same year, corn and barley at 20 cents a bushel and wheat at 36 cents were valued at $35,383,000, $9,466,400, and $7,022,160, respectively.

Minnesota is producing more than enough oats for all needs. There should be no expansion in oat acreages. In fact, the acreage might well be reduced. Rather than to enlarge the acreage, the aim should be to produce the crop more efficiently through the use of better-adapted varieties in a proper rotation.

AIMS IN OAT IMPROVEMENT

It has been the purpose of the Division of Agronomy and Plant Genetics, co-operating with the Division of Plant Pathology and Botany of the Department of Agriculture, University of Minnesota, to develop varieties of oats that excel in agronomic characters, particularly in strength of straw, in yielding ability, and in resistance to diseases. Varieties having these qualities tend to stabilize production. Anthony, Minrus, and Rainbow are resistant to black stem rust, and varieties resistant to crown rust and the smuts are in process of development.

VARIETIES FOR CENTRAL AND NORTHERN MINNESOTA

For the northern two-thirds of the state, Anthony has proved a suitable variety, and Minrus and Rainbow have yielded nearly as well (see Table 1). Anthony was produced by the Minnesota Agricultural Experiment Station from a cross between White Russian and Victory.

It has proved to be as resistant to stem rust as its White Russian parent, and this resistance, together with high yielding ability, is probably the reason why it has yielded more than Victory. It is a mid-season, white-grain variety, with a spreading panicle and stiff straw.

Table 1

Yields of Oat Varieties in Western and Northern Minnesota in Bushels Per Acre and in Per Cent of Anthony, 1928-32

Variety	Minn. No.	Morris		Crookston		Grand Rapids		Duluth		Grand Average	
		bu.	per cent	bu.	per cent	bu.	per cent	bu.	per cent	bu.	per cent
Anthony	686	63.2	100.0	71.1	100.0	61.7	100.0	64.2	100.0	64.6	100.0
Victory	514	55.5	87.8	62.8	88.3	58.2	94.3	55.6	89.1	58.0	89.8
Minrus	693	61.6	97.5	68.3	96.1	61.1	99.0	59.0	94.6	62.5	96.7
Rainbow	710	59.1	93.5	67.0	94.2	63.5	102.9	60.0	96.2	62.4	96.6
Gopher	674	62.2	98.4	65.9	92.7	60.6	98.2	54.4	87.2	60.8	94.1

Minrus, also produced by the Minnesota station, was developed by crossing Minota and White Russian. It is as resistant to stem rust as Anthony, yields more than Anthony in southern Minnesota, and nearly as well in the central and northern sections. It is four or five days earlier in maturity than Anthony, and for that reason may be grown to advantage in southern Minnesota on light soils, where the short-straw varieties, Gopher and Iogold, are unsatisfactory.

Rainbow, developed by the North Dakota Agricultural Experiment Station, is a selection from Green Russian. It is mid-early, open-panicled, and has yellow grain. It is resistant to stem rust and somewhat resistant to crown rust. It is more subject to lodging than Anthony, Minrus, or Gopher.

VARIETIES FOR SOUTHERN MINNESOTA

Yields at University Farm, Waseca, and Morris are an indication of the adaptability of the several varieties to central and southern Minnesota (see Table 2). Stem rust has not been a factor at University Farm, St. Paul, and Victory has yielded about the same as Minrus and Anthony. At Morris, both Minrus and Anthony have yielded higher than Victory. The differences have been still greater at Waseca, where stem rust frequently causes large reductions in the yields of susceptible varieties. In the Waseca trials, Gopher has yielded about the same as Minrus and Anthony and slightly less than Iogold.

Gopher is recommended particularly for heavy soils where other varieties may lodge severely.

Table 2

Yields of Oat Varieties at University Farm, Waseca, and Morris in Bushels Per Acre and in Per Cent of Gopher, 1928-32

Variety	Minn. No.	U. Farm		Waseca		Morris		Grand Average	
		bu.	per cent	bu.	per cent	bu.	per cent	bu.	per cent
Gopher	674	71.6	100.0	79.0	100.0	62.2	100.0	70.9	100.0
Iogold	711	66.1	92.3	80.1	101.4	60.2*	96.8	68.8	97.0
Rainbow	710	65.2	91.1	78.8	99.7	59.1	95.0	67.7	95.5
Minrus	693	70.6	98.6	82.7	104.7	61.6	99.0	71.6	101.0
Anthony	686	67.7	94.6	75.7	95.8	63.2	101.6	68.9	97.2
Victory	514	69.8	97.5	61.4	77.7	55.5	89.2	62.2	87.7

* Iogold was not grown at Morris in 1928; average is weighted.

Varietal Trials With Farmers

Following the crown rust outbreak in 1927, many southern Minnesota farmers questioned the suitability of existing varieties of oats for southern Minnesota conditions. At that time Gopher was the leading variety in the southern counties, and, since that variety was susceptible to rust, yields were greatly reduced. As a result, to determine what varieties might properly be recommended, extensive trials were begun in 1929. In these trials, outstanding local varieties were compared with the recommended experiment station varieties. The Division of Agronomy and Plant Genetics and the Division of Extension of the University Department of Agriculture, together with county agents, co-operated with farmers in the enterprise.

The principal local varieties, in each county in which trials were to be made, were selected. Seed supplies of these varieties were sent to University Farm where they were cleaned and treated for smut in exactly the same manner as seed for station trials is treated. The trials were made on uniform land and the plots were also replicated, according to the plan used by the experiment station in its regular experimental work, so that the accuracy of the data obtained could be checked.

The standard varieties chosen for the tests were Gopher, Iogold, Minrus, Rainbow, Anthony, and Iowa 105. The farm varieties included Russian Green, Green Russian, Little Yellow, Swenson, Sawyer's Yellow King, Wisconsin Pride, Gunderman, and Medium Yellow. Green Russian and Russian Green apparently are the same variety, as are Little Yellow and Iowa 105. Medium Yellow is of unknown origin.

Swenson is a late-maturing side oat. Sawyer's Yellow King was mixed with black oats, but resembled the Golden Rain variety. Gunderman is of Kherson type, with considerable mixture. Wisconsin Pride is a recognized early-maturing variety. The results of the farm trials in southern Minnesota are given in Table 3.

Table 3

Yields of Oat Varieties in Bushels Per Acre in County Trials in Southern Minnesota, 1930-32

Variety	Fillmore	Blue Earth	Martin	Jackson	Brown Cottonwood Watonwan	Lyon Redwood Murray	Nobles	Yellow Medicine	Lincoln	Average yield in per cent of Gopher
	bu.	bu.	bu.	bu.	bu.	bu.	bu.	bu.	bu.	per cent
Gopher	56.2	80.8	85.4	70.9	57.0	56.1	62.3	82.8	56.8	100.0
Iogold	56.6	79.6	89.6	71.1	62.1	58.2	64.1	91.0	54.3	103.0
Minrus	54.3	80.2	88.2	64.8	62.2	55.0	57.8	72.8	56.9	97.3
Anthony	47.7	70.3	78.7	57.7	...	...	...	63.0	53.4	85.6
Iowa 105	55.2	75.8	85.5	73.3	53.7	52.0	57.9	83.2	47.0	95.9
Russian Green	52.4	77.3	80.3	56.8	52.5	56.4	56.0	70.1	42.5	89.5
Rainbow	51.9	68.3	79.3	69.7	58.0	58.0	62.4	70.6	54.3	94.1
Little Yellow	54.5	67.1	...	64.8	52.1	...	...	69.0	47.5	87.8
Swenson	...	...	59.6	...	...	...	...	49.1	44.1	67.9
Medium Yellow	...	...	...	...	...	...	...	63.7	50.4	81.8
Sawyer's Yellow King	...	...	...	...	...	58.7	...	...	...	104.6
Wisconsin Pride	...	...	...	...	...	57.0	...	...	...	101.6
Gunderman	...	...	...	...	...	62.1	...	...	...	110.7

Varieties Recommended on Basis of Trials With Farmers

Iogold gave the highest yield, followed closely by Gopher. Minrus, Iowa 105, and Rainbow also yielded well. Iogold, a yellow oat resistant to stem rust, is the result of a selection from Kherson by the Iowa Experiment Station. Gopher, a white oat, is the result of a selection from Sixty Day made by the Minnesota Experiment Station. Altho susceptible to stem rust, it usually escapes rust because of its earliness. Either of these varieties is suitable for southern Minnesota. On the heavier soils, where lodging may occur, Gopher will probably prove the more desirable variety. Otherwise, the choice of variety is largely one of personal preference.

VARIETIES FOR PEAT AND SAND

In extensive trials on peat soil, in co-operation with the Division of Soils of the University Department of Agriculture, Minrus gave the highest yields, followed by Iowar, Rainbow, and Gopher. Minota has

proved the highest-yielding variety on sandy soils. Complete reports on the yields of oat varieties on sand and on peat are given in Bulletins 291 and 292 of the Minnesota Agricultural Experiment Station, University Farm, St. Paul, Minn.[1]

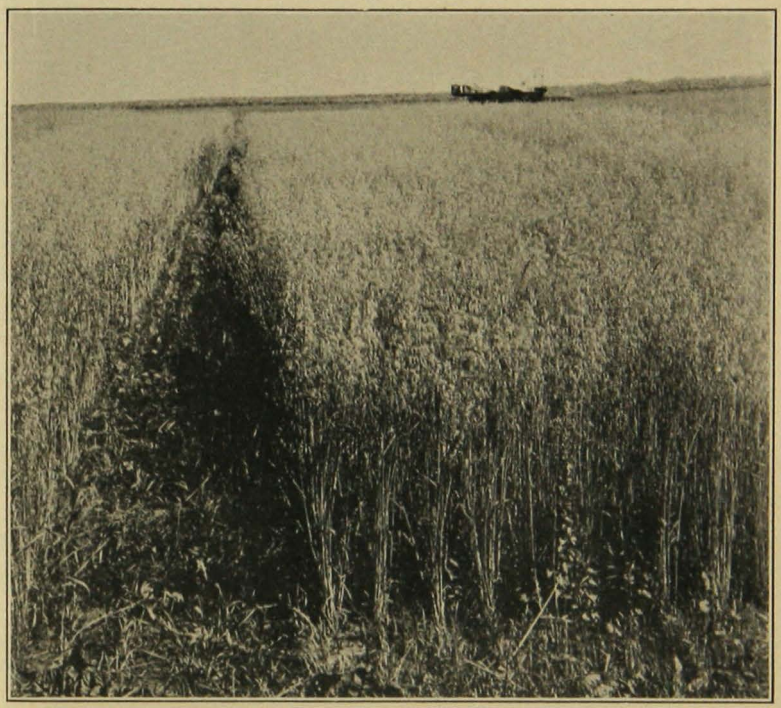

Figure 1. Gopher Oats at Right
This stiff-strawed, early-maturing variety has a wide adaptation in Minnesota.

PERCENTAGES OF HULL FOR STANDARD VARIETIES

Studies of hull percentages have been made at University Farm, St. Paul, and at Crookston, several of the recommended varieties being used in the tests. The studies were made because there is a common opinion among farmers that varieties with plump-appearing grains, such as Anthony and Gopher, have a lower percentage of hulls than

[1] Hayes, H. K., Arny, A. C., Wilson, H. K., and Powers, LeRoy. Crop Investigations on Sandy Lands. Minn. Agr. Exp. Sta. Bull. 291, 1932. Crop Investigations on Peat Lands. Minn. Agr. Exp. Sta. Bull. 292, 1932.

varieties like Minrus and Minota with grains of thinner appearance. Averages for a three-year period, 1930-32, are given in Table 4.

Table 4

Hull Percentages of Standard Varieties of Oats

Variety	U. Farm	Crookston	Average
	per cent	per cent	per cent
Gopher	27.5	25.6	26.6
Iogold	27.8	26.1	27.0
Rainbow	25.2	25.0	25.1
Minrus	26.5	25.7	26.1
Anthony	29.7	30.7	30.2

In these studies, as the table shows, Anthony had a higher percentage of hull than other varieties, and Rainbow had the lowest percentage. There was a close agreement between the results obtained at the two stations.

CULTURE AND SEED TREATMENT

The oats crop is commonly seeded on cornstalk land, and is used as a companion crop for small-seeded grasses and legumes which follow in the rotation. Two bushels per acre, of well-fanned seed, is enough in most cases. If the seed is broadcast, it is advisable to seed three bushels to the acre. All seed should be treated for smut, either with three ounces of ceresan per bushel of oats or with formaldehyde. For detailed directions as to seed treatment, farmers are advised to write to the Division of Plant Pathology and Botany, University Farm, St. Paul, or to the Bulletin Office at the same address, for Extension Folder No. 28, "Reduce Smut Losses."